

REMARKS

Claims 20-31 are pending in the application and have been examined. Claims 20-31 stand rejected under 35 U.S.C. § 103(a). The Examiner's rejection of Claims 20-31 under 35 U.S.C. § 112, first paragraph and under 35 U.S.C. § 103(a) was appealed in a Notice of Appeal filed on December 10, 2004 to the Board of Patent Appeals and Interferences (BPAI) with an Appeal Brief filed on February 9, 2005, and a Reply Brief filed on July 13, 2005, each of which is incorporated herein by reference. In the Decision on Appeal, dated June 6, 2006, the BPAI reversed the Examiner's rejections of Claims 20-31 under 35 U.S.C. § 112, first paragraph, but affirmed the rejection of Claims 20-31 under 35 U.S.C. § 103(a). Claim 20 has been amended. Reconsideration and allowance of Claims 20-31 in view of the following remarks is respectfully requested.

The Rejection of Claims 20-31 Under 35 U.S.C. § 103(a) as Being Unpatentable Over Bridgwater (1992) in *Handbook of Quantitative Forest Genetics*, Kluwer Academic Pub., Dordrecht, The Netherlands, pp. 69-95, in view of El-Kassaby and Ritland (1992), *Theor. Appl. Genet.* 83(6-7):752-8 and Stoehr et al. (1998) *Can. J. For. Res.* 28:187-95

Claims 20-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bridgwater (1992) in *Handbook of Quantitative Forest Genetics*, Kluwer Academic Pub., Dordrecht, The Netherlands, pp. 69-95, in view of El-Kassaby and Ritland (1992) *Theor. Appl. Genet.* 83(6-7):752-8 and Stoehr et al. (1998) *Can. J. For. Res.* 28:187-95. According to the Examiner, it would have been obvious to one of ordinary skill in the art to utilize the method of polymix tree breeding taught by Bridgwater and to modify that method by utilizing the pedigree analysis step in the Douglas fir polymix breeding program taught by El-Kassaby and Ritland and to further modify that method by utilizing the DNA marker taught by Stoehr et al. Applicants respectfully disagree.

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As an initial matter, applicants wish to point out that Claim 20, from which Claims 21-31 depend, has been amended to clarify step (e) of the method which now recites "(e) using the pedigree and phenotype score to identify a plurality of elite trees having an acceptable level of relatedness for inclusion in a breeding group for use in a next generation of tree breeding to produce an advanced generation having increased genetic gain." Support for this amendment is found throughout the specification as filed, for example page 7, line 34, to page 8, line 2; page 10, lines 18-22; page 13, lines 20-35; page 14, lines 3-31; page 16, line 19, to page 17, line 11; and page 21, lines 28-32. As described in the specification, the claimed method is useful as a long-term tree breeding improvement program for increasing genetic gain while reducing the number of generations that are required. Specification at page 7, line 26, to page 8, line 12.

For the reasons set forth in detail below, applicants respectfully submit that the burden of establishing a *prima facie* case of obviousness for the invention has not been met because there is no suggestion to combine or modify the reference's teachings to arrive at the claimed invention, as amended. The invention is directed to a new tree breeding method that utilizes cost and time effective parental pedigree determination using molecular analysis in conjunction with phenotypic scores to efficiently select elite progeny plants for use in the next generation of tree breeding in order to accomplish tree improvement through future generations. As described in the specification, the general view of those of skill in the art prior to the present invention was that DNA marker and analytical tools had "some shortcomings when dealing with the special circumstances resulting from the interbreeding of small, elite populations where many of the individuals are highly related to each other, as in the present invention." Specification at page 26, lines 27-31.

It is respectfully submitted that Bridgwater does not teach or suggest step (d) determining the pedigree of a plurality of progeny trees using DNA analysis, or step (e) using the pedigree

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and phenotype score to identify a plurality of elite trees having an acceptable level of relatedness for inclusion in a breeding group for use in a next generation of tree breeding to produce an advanced generation having increased genetic gain, as required by Claim 20 as amended, from which Claims 21-31 depend. Instead, Bridgwater simply provides a review of different types of mating designs used in breeding programs, including polymix breeding. Bridgwater provides no suggestion or motivation to either use DNA analysis to determine the pedigree of progeny trees, as recited in step (d) of Claim 20, or to use a pedigree and a phenotype score to identify elite trees, as recited in step (e) of Claim 20. Moreover, applicants submit Bridgwater teaches away from the use of polymix breeding by stating that "[i]f there is strong variation for general combining ability among males and inbreeding depression is present, selection in base populations produced from polycross matings will reduce expected gains since most selections may be progenies of the same few pollen parents" (Bridgwater, page 75, first full paragraph).

As further described below, neither El-Kassaby and Ritland nor Stoehr et al. provide any motivation or suggestion to modify the teachings of Bridgwater to arrive at the claimed invention.

It is submitted that El-Kassaby and Ritland do not teach or suggest any of the steps of (c) evaluating progeny trees grown from each of the progeny lots using objective criteria to obtain a phenotype score, (d) determining the pedigree of a plurality of progeny trees using DNA analysis, or (e) using the pedigree and phenotype score to identify a plurality of elite trees having an acceptable level of relatedness for inclusion in a breeding group for use in a next generation of tree breeding to produce an advanced generation having increased genetic gain, as required by Claim 20. El-Kassaby and Ritland describe a study of male reproductive success using a polymix of three pollen donors, in which the paternity of progeny was determined based on four protein markers (El-Kassaby and Ritland, page 753, column 2). El-Kassaby and Ritland provide

no suggestion or motivation to use their method of determining paternity in a tree breeding program. Specifically, there is no suggestion or motivation in El-Kassaby and Ritland to determine the pedigree of progeny trees using DNA analysis and using the pedigree information as well as a phenotype score to identify a plurality of elite tree for inclusion in a breeding group.

Similarly, applicants submit that Stoehr et al. do not teach or suggest the steps of (c) evaluating progeny trees grown from each of the progeny lots using objective criteria to obtain a phenotype score, or (e) using the pedigree and phenotype score to identify a plurality of elite trees having an acceptable level of relatedness for inclusion in a breeding group for use in a next generation of tree breeding to produce an advanced generation having increased genetic gain, as required by Claim 20. Rather, Stoehr et al. use a polymorphic genome marker to estimate the level of outside-orchard pollen contamination, supplemental mass pollination efficacies and natural selfing in Douglas fir (Stoehr et al., Abstract). Stoehr et al. provide no motivation or suggestion to use their method in a tree breeding program. Specifically, there is no suggestion or motivation in Stoehr et al. to use pedigree information as well as a phenotype score to identify a plurality of elite trees for inclusion in a breeding group.

As described above, it is submitted that a *prima facie* case of obviousness has not been established because there is no motivation or expectation of success in combining these references to arrive at the claimed invention. For at least the reasons described above applicants believe the claims as amended are allowable over the cited references. However, to further support applicants' position that the invention is not obvious in view of the cited references, appended hereto as Attachment A is the Declaration of inventor Dr. Clements C. Lambeth ("the Lambeth Declaration") which describes experiments carried out by Dr. Lambeth and his colleagues that further validate the advantages of practicing the claimed breeding method. Also provided in the Lambeth Declaration is evidence regarding the satisfaction of a long-felt need by

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the method of the invention, acceptance of the claimed method by those in the field of tree breeding, and evidence of copying by others. It is submitted that the objective evidence provided in the Lambeth Declaration speaks to the nonobviousness of the claimed invention, for the reasons described in more detail below.

The Lambeth Declaration provides objective evidence that the claimed subject matter solved a problem that was long standing in the field of tree breeding (pages 3-7, Lambeth Declaration). The Lambeth Declaration points out that others of ordinary skill in the art were working on the problem of using a polymix breeding scheme in isolation from other crossing schemes in a tree breeding program for at least the past 20 years or longer (pages 3-5, Lambeth Declaration, see also Attachments D-G as described in the Lambeth Declaration and appended hereto). The Lambeth Declaration then provides objective evidence that the claimed invention solves the limitations of the polymix breeding system and satisfies the long-felt need. In response to the publication in 2001 of the journal article describing the claimed invention (Lambeth, C.C. et al., *Theor. Appl. Genet.* 103:930-943 (2001)), the inventors received favorable comments from scientists in the field and several requests for collaboration. For example, as described in the Lambeth Declaration (see pages 5-7) the claimed invention has now been used in collaboration between the inventors and several different scientists in eucalypt species and popular species and the positive results of these studies have been published in a poster presented at a scientific meeting (see the poster article by Minique, H. et al., 2004, attached hereto as Attachment I), and a paper published in a scientific journal (see Wheeler et al., *Tree Genomics and Genomes* 2:53-60 (2006), attached hereto as Attachment J). As further evidence of acceptance of the claimed method in the field, the Lambeth Declaration describes examples of other scientists copying the methods of the invention, with specific reference to the Lambeth et al. 2001 publication. For example, see Drattapaglia et al., *Theor. Appl. Genet.* 109:192-199

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(2004), attached hereto as Attachment K, and Burdon et al., IUFRO Division 2 Proceedings, 2004, attached hereto as Attachment L, as described in the Lambeth Declaration on pages 6-7. As stated by the Federal Circuit, "[a]ppreciation by contemporaries skilled in the field of the invention is a useful indicator of whether the invention would have been obvious to such persons at the time it was made." *Vulcan Engineering Co, Inc. v. Fata Aluminum, Inc.*, 278 F.3d 1366, 1373 (CAFC 2002).

It is submitted that the evidence provided in the Lambeth Declaration demonstrates the existence of a long-felt unmet need that was satisfied by the present invention and copying of the present invention by others in the field. It is well established that evidence rising out of the so-called "secondary considerations" must always when present be considered en route to a determination of obviousness. See M.P.E.P § 716.01(a), citing *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). Moreover, the existence of an enduring unmet need is strong evidence that an invention is not obvious. See *In re Mahurkar*, 831 F. Supp. 1354, 1378 (1993).

Accordingly, it is submitted that the claimed invention is not obvious over the cited references. Withdrawal of this ground of rejection is respectfully requested.

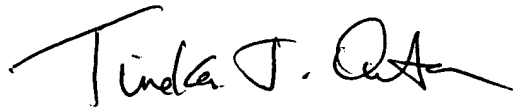
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CONCLUSION

In view of the above amendments, the foregoing remarks and the Lambeth Declaration, applicants respectfully submit that all the pending claims are in condition for allowance. If any issues remain that may be expeditiously addressed in a telephone interview, the Examiner is encouraged to telephone the applicant's attorney at the number listed below.

Respectfully submitted,

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